Hindawi Publishing Corporation
Active and Passive Electronic Components
Volume 2013, Article ID 596065, 2 pages
http://dx.doi.org/10.1155/2013/596065

Hindawi

Editorial

Metal-Insulator-Semiconductor Field-Effect Transistors

Kuan-Wei Lee,[1] Edward Yi Chang,[2] Yeong-Her Wang,[3] Pei-Wen Li,[4] and Yasuyuki Miyamoto[5]

[1] *Department of Electronic Engineering, I-Shou University, Kaohsiung 840, Taiwan*
[2] *Department of Electronic Engineering, National Chiao Tung University, Hsinchu 300, Taiwan*
[3] *Department of Electrical Engineering, Institute of Microelectronics, National Cheng Kung University, Tainan 701, Taiwan*
[4] *Department of Electrical Engineering, National Central University, Taoyuan 320, Taiwan*
[5] *Department of Physical Electronics, Tokyo Institute of Technology, Tokyo 152-8552, Japan*

Correspondence should be addressed to Kuan-Wei Lee; kwlee@isu.edu.tw

Received 4 February 2013; Accepted 4 February 2013

In the last few decades, there has been a tremendous progress in metal-insulator-semiconductor field-effect transistors (MISFETs) and their applications. Among many possible semiconductor material choices for MISFETs, Ge, III-V, and III-N semiconductors have attracted considerable attentions as the channel for MISFETs. These devices are used in a large number of different circuits such as power amplifiers, low-noise amplifiers, mixers, frequency converters, and phase shifters. Also, high-k dielectric materials are now playing an important role in the high-mobility-channel devices for improving speed and drive current performance. We invite authors to contribute original research as well as review articles on the recent progress in all kinds of MISFETs and their applications.

One paper in this issue entitled "*The improvement of reliability of high-k/metal gate pMOSFET device with various PMA conditions*" discusses the improvement of reliability of high-k/metal gate pMOSFET with various postmetallization annealing conditions.

In another paper entitled "*Gate stack engineering and thermal treatment on electrical and interfacial properties of Ti/Pt/HfO_2/InAs pMOS capacitors*," the authors explore effects of gate stack engineering and postmetallization annealing on electrical and interfacial properties of Ti/Pt/HfO_2/InAs pMOS capacitors. An As-rich InAs interfacial layer further suppresses the surface states, evidenced by the reduction of gate leakage, and depletion/inversion capacitances.

The paper "*Comparative study of SiO_2, Al_2O_3, and BeO ultrathin interfacial barrier layers in Si metal-oxide-semiconductor devices*" investigates effects of SiO_2, Al_2O_3, and BeO ultrathin interfacial barrier layers on Si MOS devices. Inserting an ALD BeO interfacial layer between the Si channel and high-k gate dielectric enhances high-field carrier mobility and improves MOSFET parameters and reliability characteristics while maintaining a similar EOT.

The paper "*GaN-based high-k praseodymium oxide gate MISFETs with $P_2S_5/(NH_4)_2S_x$ + UV interface treatment technology*" presents the AlGaN/GaN MISFETs with high-k Pr_2O_3 in which the AlGaN Schottky layers are treated with $P_2S_5/(NH_4)_2S_x$ + UV illumination. This novel pretreatment is therefore proven to be suitable for low-noise GaN MISFET applications.

The paper entitled "*Comprehension of postmetallization annealed MOCVD-TiO_2 on $(NH_4)_2S$ treated III-V semiconductors*" deals with the electrical characteristics of MOCVD-TiO_2 grown on p-type InP and GaAs. With $(NH_4)_2S$ treatment, the electrical characteristics of MOS capacitors are improved due to the reduction of native oxides. The electrical characteristics can be further improved by the postmetallization annealing, which causes hydrogen atomic ion to passivate defects and the grain boundary of polycrystalline TiO_2.

The paper entitled "*A novel nanoscale FDSOI MOSFET with block-oxide*" proposes a novel planar fully-depleted

silicon-on-insulator nMOSFET with block-oxide-enclosed Si body by applying oxide sidewall spacer technology. The presence of block-oxide along the sidewalls of the Si body significantly reduces the influence of drain bias over the channel. The novel FDSOI structure shows improved performance over conventional FDSOI.

These papers show the research topics representative of some of the active and original areas of MISFETs. It is hoped that these articles included here aid the reader in gaining a better understanding of some new and important research field.

The guest editors are pleased to submit this special issue to Hindawi Publishing Corporation and hope that this issue accomplishes the goal of highlighting outstanding advances in the MISFETs. Many thanks are expressed to all the reviewers who contribute their most valuable comments.

Kuan-Wei Lee
Edward Yi Chang
Yeong-Her Wang
Pei-Wen Li
Yasuyuki Miyamoto